CLAIMS

1. An electrochemical sensor for measuring the amount of hydrogen sulphide or thiols in a fluid, the sensor comprising containment means which is adapted to receive the hydrogen sulphide or thiols from the fluid and which contains a precursor and a reaction solution which together with the hydrogen sulphide or thiols create a redox reaction resulting in an electrical current dependent upon the amount of hydrogen sulphide or thiols in said fluid, wherein the containment means comprises an electrically conductive porous member in which said precursor and said reaction solution are dispersed.

2. An electrochemical sensor as claimed in claim 1, wherein the porous member is moulded from a mixture of the precursor and a suitable binder all in powder form, and the reaction solution is dispersed in the pores of the porous member.

3. An electrochemical sensor as claimed in claim 2, wherein the precursor is selected from N,N'-diphenyl-1,4-phenylenediamine, N,N' dimethylphenyl-1,4-diamine, catechol and dopamine.

4. An electrochemical sensor as claimed in claim 2 or claim 3, wherein the binder is an epoxy resin.

5. An electrochemical sensor as claimed in claim 4, wherein the binder is a 12% hardener Durcisseur MA2.

6. An electrochemical sensor as claimed in any one of claims 2 to 5, wherein the mixture further includes a powder conductivity agent.

7. An electrochemical sensor as claimed in claim 6, wherein the powder conductivity agent is selected from metal powder and carbon powder.

8. An electrochemical sensor as claimed in claim 6 or claim 7, wherein the binder, the precursor and the conductivity agent are mixed in proportions of about 1:1.4:1.6 by weight .

9. An electrochemical sensor as claimed in any preceding claim, wherein the reaction solution includes a gelling agent.

10. An electrochemical sensor as claimed in claim 9, wherein the gelling agent is a cross-linked water-soluble polymer.

11. An electrochemical sensor as claimed in claim 10, wherein the gelling agent comprises polyacrylamide and a cross-linking agent selected from formaldehyde and N,N'-methylenebisacrylamide.

12. An electrochemical sensor as claimed in any preceding claim, wherein the reaction solution is an acidic solution such as dilute hydrochloric acid.

13. An electrochemical sensor as claimed in any preceding claim, wherein the porous member is adapted to receive the hydrogen sulphide or thiols from the wellbore fluid via a permeable membrane provided on one face thereof.

14. An electrochemical sensor as claimed in any preceding claim, wherein the porous member serves as a working electrode, and further comprising a counter electrode and a reference electrode spaced apart but in contact with the porous member, whereby, in use, said current flows between the working and counter electrodes.

15. An electrochemical sensor as claimed in any preceding claim, further comprising means for measuring said current.

16. A method of measuring the amount of hydrogen sulphide or thiols in formation fluid from an earth formation surrounding a wellbore, the method

comprising positioning a downhole tool equipped with an electrochemical sensor in accordance with any preceding claim in the wellbore adjacent to the formation, exposing the sensor to the formation fluid, and measuring the current produced by the sensor.

17. An electrochemical sensor for measuring the amount of hydrogen sulphide or thiols in a fluid, the sensor comprising containment means which is adapted to receive the hydrogen sulphide or thiols from the fluid and which contains a precursor which together with the hydrogen sulphide or thiols and a reaction solution create a redox reaction resulting in an electrical current dependent upon the amount of hydrogen sulphide or thiols in said fluid, wherein the containment means comprises an electrically conductive porous member in which said precursor is dispersed.

18. An electrochemical sensor as claimed in claim 17, wherein the porous member is deposited on a non-conductive base, and wherein the reaction solution is derived, in use, from said fluid.

19. An electrochemical sensor as claimed in claim 17 or claim 18, wherein said porous member serves as a working electrode, and further comprising a reference electrode and a counter electrode also deposited on said base, whereby, in use, said current flows between the working and counter electrodes.

20. An electrochemical sensor as claimed in claim 19, wherein said counter electrode comprises platinum.

21. An electrochemical sensor as claimed in claim 19 or claim 20, wherein said reference electrode comprises silver /silver chloride.

22. An electrochemical sensor as claimed in any one of claims 19 to 21, wherein said electrodes are deposited by screen printing.

23. An electrochemical sensor as claimed in any one of claims 19 to 22, wherein the electrodes are screened from the fluid by a permeable membrane.

24. An electrochemical sensor as claimed in any one of claims 18 to 23, wherein said base is made from a plastics material.

25. An electrochemical sensor as claimed in any one of claims 17 to 24, wherein the precursor is selected from N,N'-diphenyl-1,4-phenylenediamine, N,N' dimethylphenyl-1,4-diamine, catechol and dopamine.

26. An electrochemical sensor as claimed in any one of claims 17 to 25, wherein the porous member includes a powder conductivity agent to render it conductive.

27. An electrochemical sensor as claimed in claim 26, wherein the powder conductivity agent is selected from metal powder and carbon powder.

28. Use of an electrochemical sensor as claimed in any one of claims 1 to 15 or 17 to 27, for measuring the amount of hydrogen sulphide or thiols in a fluid, downhole, during logging.

29. Use as claimed in claim 28, wherein the logging is implemented while drilling.

30. Use as claimed in claim 28, wherein the logging is a wireline drilling.

31. Use of an electrochemical sensor as claimed in any one of claims 1 to 15 or 17 to 27, for measuring the amount of hydrogen sulphide or thiols, at the surface.

32. Use of an electrochemical sensor as claimed in any one of claims 1 to 15 or 17 to 27, for measuring the amount of hydrogen sulphide or thiols of an underground aquifer.